# PROPORTIONS OF FACTORS—ADVANTAGE AND SIZE.

## SUMMARY.

Diminishing Return, in social and static sense, points to bad proportions of labor to equipment, 594; in the social-dynamic sense, to changes in this proportion, 595.—Malthus' emphasis, 596.—The competitive-static law, 596; still a law of proportions, (*a*) in the technological sense, (*b*) in the value sense; the latter the important aspect, 598; relations of substitution and of complementarity for competitive purposes, 599.—Is the threefold classification of factors pertinent? 600.—Does the law apply only where land is used? 602.—Is the main reference to prices and to changes in prices? 603.—The applications to Distribution, 604; applications in general, 606.—Increasing Return restated as Law of Advantage (or Disadvantage) and Size, 610.—Not antithetical to the Law of Proportions, 612.—Readily mistaken for one aspect of Law of Proportions, 615.—Not dependent upon question of proportions, 616.—The applications, 617.

Is it possible to distinguish between the Law of Diminishing Return and the Law of Increasing Return? Do these laws formulate separate aspects of phenomena or apply to separate fields of subject-matter? Has the one, for example, to do only with agriculture, while the other applies exclusively to manufacture? Or is one merely the obverse of the other, as laws expressing respectively the outcome of the skilful or of the unskilful adjustment to any given set of conditions? And are there, in the sense of the ordinary formulations and interpretations, any such laws? Or have we rather to do with two other laws,—the first, the Law of Proportion of Factors, as over against the second, the Law of Advantage and Size? To the solution of these questions and of several associated questions some contribution will be attempted in this paper.

In its most general statement the Law of Proportion of Factors formulates the disadvantage accruing from any defect in the relative proportions of the factors of production. It is a law of disadvantage from bad combination.

It is a most difficult matter—as the history of doctrine fully illustrates—to preserve the distinction between the social and the competitive aspects of this Law of Proportions, and at the same time to preserve the distinction between the static and the dynamic aspects of the same law.

*The Social-static Formulation.*

It is evident that society may be badly circumstanced by virtue either of a scant aggregate equipment of productive instruments, relatively to the number of laborers, or of an equipment relatively scant in particular directions. And it is equally clear that the situation may be a fortunate one—for such members of society as there are—by the fact that the membership is a small one relatively to the supplies of land and other instrumental goods. If the per capita equipment in lands or appliances is generous, the society, taken as an aggregate is so far fortunate,—the average level of comfort is a higher level.

The transition from the static to the dynamic aspect is easily made,—is indeed almost inevitable. Whatever is dynamic leads merely to a new application of static doctrine. That is to say, in order to appraise the significance of the dynamic, there is always necessary another appeal to the static: only so is appraisal possible of the significance of the change. The dynamic aspects of any problem refer merely to the forces at work to make the situation a new and different situation. But in each new situation there is nothing new but the situa-

tion: the static doctrine is still valid; the problem in its setting of new terms remains in principle and in method of analysis the same problem.

*The Social-dynamic Formulation.*

*Society is advantaged by every change making for a more generous aggregate equipment of productive instruments* relatively to the number of laborers or making for an equipment relatively more generous in any particular direction. The social significance of this Law of Proportions is, therefore, mainly to be sought in the field of history or of prophecy. What bearing on the aggregate social welfare have changes in the relative supplies of productive factors?

To illustrate: The Black Death in England may be taken to have swept away one-half of the population of England, leaving, however, unimpaired the supply of land and of other productive equipment. It thereby became possible for the remaining population to enjoy the advantages of a better per capita equipment of land and appliances. Conditions were favorable to the resultfulness of human effort. Doubtless there were also changes in the terms of the distribution of this product among the different co-operating factors; but with the purely distributive and competitive and individual aspects of the case this social formulation of the Law of Proportions is not concerned.

And so, again, were the present population of the world to be doubled, all other things remaining the same, the per capita product of industry must suffer.

Likewise, also, if a population remaining unchanged in point of numbers were to acquire a double per capita labor effectiveness, whether by improved technique or by development in strength, or in intelligence, or in in-

tensity of effort, the social product would not thereby be doubled unless, together with this, there should take place a proportionate change in the supply of land and of other equipment. And all this means merely that if some, but not all, of the productive factors are doubled, the product will not fully double.

It is clear that this social-dynamic aspect of the law in question was that phase with which alone Malthus was logically concerned in his formulation of the social menace of population tendencies. For the purposes of Malthus' argument nothing need have been deduced as to the bearing of expanding population upon land rents. Nothing was necessarily inferred as to the trend of wages relatively to the other distributive shares, neither private ownership in land nor private ownership in any of the productive equipment necessarily assumed. The formulation was equally valid for the collectivist or for the competitive society. The investigation bore solely upon the ratio of product to the per capita of population,—on the rewards of industry as over against the pain-costs or the time-costs. The product was regarded in the weight-and-tale aspect, or, at most, as reduced to some sort of utility denominator for average or social purposes. No suggestion of the competitive or of the market-value calculus was pertinent to the problem.

### *The Competitive Formulation.*

But in a society competitively organized the private and competitive value aspects of the Law of Proportions press insistently for hearing. In its most general and inclusive statement the competitive law runs in substantial parallel with the general social law: *Disadvantage accrues to the individual from any excess or defect in the relative proportions of his factors of production.* This

is the competitive and individual aspect of the law of the bad combination of factors.

First, however, the static aspect. The explanations for this badness of combination may be various. In one way or another the entrepreneur has unskilfully gone about his undertaking,—has attempted to get on with too much or too little land,—has over-supplied or under-supplied himself with machinery or with seed or with fertilizers,—has hired too few or too many laborers or laborers of the wrong sorts or grades,—or has not correctly proportioned the different grades to one another.

But, even so, this static formulation has two important aspects,—aspects only with great difficulty distinguished,—aspects which, in fact, have never, in the history of the science, been consistently distinguished, but which none the less make imperative demand for careful and consistent distinction: (1) The law may refer to purely technological considerations,—to the fact, *e.g.*, that in market gardening or in grain production there must be seed to go with the land, or that labor must stand in some sort of proportion to machinery, no matter how high the wage or how cheap the machinery; (2) but, for ordinary competitive purposes, it is evident that a wise combination of factors must depend mainly upon the relative hires or costs at which these factors are to be had. This follows from the fact that all competitive entrepreneur computations, both of cost and of product, run in terms of value outlay as over against value product. No one combination of factors, therefore, can be asserted to be the best for purposes of the entrepreneur, and to be diverged from only with disadvantage, unless upon the assumption of an established relation of prices among the various factors employed. With each change in relative prices a new combination comes to be the best combination. It is, in fact, only by this dependence

of the amount of the employed factor upon the value of that factor that the constant redistributions and substitutions of factors become possible. If wages are high, the pressure is strong toward the introduction of machinery. In countries of low wages, machinery is little called for. If land commands high rent, it pays to increase the proportions of labor or of fertilizers or of implements.

But it is none the less true that there is all the while in the background a technological basis for this Law of Proportions. Substitutions and redistributions of factors are, no doubt, constantly taking place with every change in the relative prices of factors. But were these substitutions possible of indefinite extension, if machinery costs could be fully and entirely substituted for labor costs, if additional labor could avail fully to atone for the shortage of land, if machines did not require attendance and if horses did not need drivers, there could never set in any relative shortage of factors, and no disadvantage could ever attach to any possible proportionment of the different productive factors. Were it, for example, always and without disadvantage possible to increase the labor investment upon any given piece of land, no land shortage could ever manifest itself, and rent must disappear. If outlays for more machinery or for more expensive machinery could go on indefinitely without the call for more labor, together with the machinery,—if, that is to say, machine expenses could fully and everywhere take the place of labor expenses,—developing invention would finally deprive labor of all employment.

Value, that is to say, exists only as dependent upon some degree of scarcity. If, in agriculture, increased expenditures for non-land factors of production were not attended with constantly falling compensations both in volume and in value, no land scarcity could

exist and no land value result. So, if labor expense could be indefinitely applied to one mowing-machine or to one horse-rake, without disadvantage in the ratio of results to expense, mowing-machines or horse-rakes would mostly fail of a market. If one pound of phosphate would suffice to fertilize a continent, phosphate would be safe from ever becoming dear in price. Thus by this very fact that substitution is not indefinitely possible, it comes about that too little or too much of any productive factor gives bad results. And this is true in the value aspect precisely because it is true in the purely weight-and-tale and technological aspect. Precisely because entrepreneurs are different, is there never, at one and the same level of factor costs, any one best combination of factors for all entrepreneurs. This is constantly illustrated and attested in actual farming. One farmer rents more land or better land, and thus, through the larger rent outlay, excuses himself from what would be for him less advantageous outlays for machinery or fertilizers or labor. Another farmer finds it to his advantage to restrict himself in rent outlays and to extend his investment in the direction of machinery or fertilizers or labor.

But, let it be repeated, that the principle of substitution holds at each entrepreneur margin does not prove that the principle of substitution is indefinitely applicable at no matter how distant removes from the margin of substitution; for otherwise there would be nowhere any disadvantage from an increase of expense upon a fixed supply of land, or any loss from twenty laborers working at one loom, or, for that matter, any reason why indefinite wagons should not dispense with the need of horses and drivers.

It is, however, clear, that in the main the technological relation between the different production goods

is one of complementarity and interdependence rather than of the infinite possibility of substitution. More men with more machines may call for more land rather than for less or for the old land at a higher rate of rental. Machinery does not displace men indefinitely, but, under stable conditions of technique, calls instead for men to fashion or to tend. Wagons furnish a demand for drivers, ships for sailors, horses for drivers, drivers for wagons, and so on without limit.

But it is now necessary to note that in all this there is no warrant for the threefold or fourfold division of productive factors, since it is equally clear that bricklayers furnish a demand for hod-carriers, carpenters for masons, wagons for horses, sailors for cooks, engines for cars, cars and engines for coal, rails for ties, meadow land for pasture, and both for timber land, and so on indefinitely. So an increase in artisan skill may intensify the demand for some machinery the while that it displaces other. So, also, enlarged supplies of some grades of labor furnish a demand for other grades of labor; *e.g.*, carpenters for architects and masons, spinners for weavers. Again, some machinery creates a demand, not for land as complementary good, and not, in any appreciable degree, for labor, but for other machinery. In the history of English industry the spinning jenny placed an immense premium upon the invention of the power loom, and both called shrilly not for more men, but for the introduction of power machinery. New coal lands would injure the wood lots and benefit the iron mines. New fisheries would probably lower the income from pasture land, and perhaps intensify the demand for cereal lands.

The truth is that all of these relations — on the one hand, of complementarity, on the other, of substitution — depend upon the particular situation in point of tech-

nique, and have not even the remotest relation to the land-capital-labor classification. It is possible enough—it is indeed characteristic of modern life—that modifications in technique (that is to say, in the human factor of production) greatly reduce the pressure upon land. This is especially noticeable in the effect of farm machinery toward the lowering of agricultural rents taken in the aggregate. Improvements in transportation work in the same direction, and at the same time do another thing: they create accessibility. Thus, practically speaking, they create land.

But all this in no wise avails to impeach the Law of the Proportion of Factors, but applies rather to support and to emphasize it, at the same time vastly extending its scope.

But why does the point always arrive at which nothing serves as a substitute for more land,—a point, that is, at which more and more intensive cultivation gives more and more meagre returns? And, for that matter, to what quality or characteristic of machinery is it due that only so many men can work with one unit of capital goods? The answer must be shortly given and be left to approve itself. The one attribute of land which finally discourages all attempts at substitution, and assures to land its ultimate relation of complementarity, appears to be the spatial attribute,—the impossibility of compressing agricultural or building or climatic or scenic aspects of land utility into ever smaller compass and without limit of disadvantage.

With machinery as related to labor, the spatial fact seems to be sometimes important; but the complementarity more commonly traces to the recurrent necessity in all machine processes for volition and direction.

In the interests both of safety and of accuracy great

care must be taken that all competitive formulations of the Law of Proportions run consistently in value terms. For competitive purposes the following formulations are evidently wide of the point. "In agriculture . . . by increasing the labor the produce is not increased in equal degree",[1] or "The application of increased capital and labor to land will add a less than proportionate amount to the produce raised";[2] or "Additional investments of labor and capital . . . yield a proportionate increase in product";[3] or "In the extractive industries the continual investment of labor and capital on any given tract of land will . . . yield a diminishing proportionate return";[4] or "After a certain point has been passed in the cultivation of an acre of land . . . increased applications of labor and capital yield less than proportionate returns in product";[5] or "Whenever double the amount of exertion yields more than double the amount of product, we are in the presence of the Law of Increasing Returns or Decreasing Costs. When double the exertion just doubles the output, we have the Law of Constant Returns or Constant Cost";[6] or "In the case of agricultural land . . . additional doses of capital and labor will yield a relatively smaller produce." [7]

Land costs, labor costs, material costs, wage costs, and opportunity costs, all require the rendering over into the denominator of price or of entrepreneur capital, and must be set over against a total of value product before the so-called Law of Diminishing Return or any other law of return can come to be relevant to the entrepreneur computation. Land as superficies, plus labor and cap-

[1] Mill, Principles of Political Economy, Book I, chap. xii, sect. 2.

[2] Marshall, Principles of Economics, 4th edition, p 230.

[3] Bullock, Quarterly Journal of Economics, xvi, p. 475.

[4] Ibid, p 480.

[5] Seager, Introduction to Economics, p 114.

[6] Seligman, Principles of Economics, p. 250.

[7] Ibid., p. 306.

ital somehow aggregated, cannot be compared with weight-and-tale product, and still less with value product.

Nor can any formulation be strictly to the purpose of the entrepreneur analysis, when the costs are duly aggregated into value and price totals, but are set over against mere quantity of product. Quantity of product appeals to the entrepreneur only as it may directly translate into value of product. And this truly it may often do, but only on condition that the product of the enterprise is a relatively small one and the competitors many. But in any case the competitive law must be made exclusively a value law, either in terms or by interpretation.

But what now is the significance of the Law of Proportions taken in the competitive and in the purely static sense? Does the law in any sense throw light on the determination of prices? No *social* law of return—whether static or dynamic—is relevant to the price adjustment. Nor, so far as we have yet gone with the competitive-static analysis, have we at all advanced ourselves for any purposes of the price problem. To assert that the less shrewd the entrepreneur in fixing the relative proportions of factors, the smaller will be his value product, does indeed vaguely hint of the profits accruing to him relatively to his competitors,—says in substance that here as elsewhere the unskilful man gets the worst of things, but makes no deliverance as to prices. True it is that, if entrepreneurs should become more capable in any industry, prices might thereby be affected, but this is to smuggle dynamic facts into a purely static problem.

Nor has any basis been so far offered for distributive inferences, unless perhaps with this single reference to profits. We have only a greater or smaller total of value

product relatively to the total of value costs, accordingly as the productive factors have been well or ill combined. But in this there is nothing to indicate whether wages will rise or fall, whether absolutely or relatively to rent or interest,—nothing to show that rent will gain or lose in the total or in relation to any other distributive share. We have in fact arrived at nothing better than an entirely obvious conclusion as to the profits of entrepreneurs relatively to one another.

But, so far as the Competitive-static Law is valid and serviceable,—and for whatever purposes it is valid and serviceable,—it is obviously a law equally applicable to all the co-operating productive factors. It is not in any especial degree a law of agricultural production; nor is it a law valid only by virtue of the presence and the use of land and in the degree solely of this presence and use.

Where, then, shall warrant be found for the doctrine—purely as a static formulation—that, if land is relatively scarce, land rent must be high relatively to other costs? Or that, if laborers become scarce, their wages are likely to rise? Or that a scarce loan fund means high interest rates, other things remaining the same? Or that machine rents are commonly high if the particular kind of machine is difficult—costly—to obtain?

Doubtless all these propositions are valid; but for these particular and specific laws neither formulation nor justification has yet been given. And more than this,—the distributive analysis necessary to justify any one of these formulations is an analysis both difficult and delicate. All this, however, will become clearer in our examination of the Law of Proportions in its fourth and last aspect, the competitive-dynamic.

*The Competitive-dynamic Formulation.*

Here, again, the step from the static to the dynamic is so ready of making as to be almost inevitable. Whatever is true for the analysis of the static situation before the dynamic influences have come to apply will *in doctrine and method* hold for the analysis of the situation in its new setting. For a full treatment of the dynamic aspects of our problem we should therefore have to inquire: (1) as to the influences resulting in changes in the relative supplies of particular factors, or in the relative demands for products, or in the technological relations between the various productive factors; (2) as to the bearing of these changes (*a*) upon the total of the entrepreneur's value product relative to his value costs; (*b*) upon the relative changes in his outlays for the various cost factors,—that is to say, upon the terms of the distribution of his value product. For costs to the entrepreneur are distributive shares to the recipients.

(1) Nothing worth while can be offered here in explanation of the various aspects of change in the human factors in the economic situation, either (*a*) on the demand side, in numbers, in needs, and in desires, absolutely and relatively; or (*b*) in the aspect of productive agent,—in health, strength, endurance, industry, moral qualities, or in social and economic institutions; or (*c*) as bearing on productive equipment,—in abstemiousness, in the expansion of credit relations, in the extension of transportation activities, and, in general, in the progressive development of the science and technique of industry. Nor can more or better be done in rendering account of the changes in supplies of industrial equipment,—the subjugation of new fields, the opening up of new continents.

Nothing, indeed, is here both practicable of doing and

worth while doing further than shortly to note the bearing of relative increases in the supplies of productive factors upon the values of the products especially due to them, and upon the relative distributive shares imputed to them out of the jointly produced values.

It was surely never a great or an important discovery with regard to prices that, if they change at all, they must either go up or go down. Equally safe, and of equal significance, was the corresponding deliverance with regard to costs: they will remain constant or they will rise or they will fall. There is, indeed, a question whether a scientific law can properly be anything other than a grouping of phenomena with relation to one specific causal influence,—some question, that is to say, whether a formulation asserting merely the outcome and resultant of the composition of several different co-operating influences is, in any proper sense of the word, a law at all. But, unless as coming under this objection, there can surely be no harm, and no service, in indicating by the Law of Constant Return the sheer fact that prices will turn out not to change, or in dignifying by the name Diminishing Return a trend toward rise in price, or in understanding by Increasing Return a probable or certain fall of price.

But the competitive-dynamic law of proportions may reasonably be expected to bear more desirable fruit than this. Taking it as granted that changes in the relative supplies of productive factors are to occur, an inquiry, or a series of inquiries, may certainly be projected as to the resultant trend of prices. And there is no doubt also that, as matter of detail and of process in a competitive-entrepreneur economy, this trend of things would perforce express itself as a change in relative costs. But the entrepreneur costs are themselves results of the

changing aggregate situation, and only as intermediate terms in a longer causal sequence to be regarded as causes of any sort. The ultimate determinant of the high price of any product is to be found in the scarcity of the productive factors upon which the forthcoming of the product is conditioned. Accurately, *for present purposes* it may be said that the causal sequence runs from scarcity of factors to scarcity of product, thence to the high value of the product, thence to the high pay of the factors, and thence to the high value of the factors.

No detailed discussion or analysis of the distributive process is practicable here. Enough has perhaps been said to indicate that all such laws of return as report the absolute or relative share of any value product imputed to any item or class of productive factors are rather laws summarizing the distributive outcome than indicating or reporting the play of causal forces and the direction of the causal sequence. They are not so much laws illuminating other problems as deriving illumination from other solutions. At best they merely furnish the cost-underpinning for the shaky entrepreneur-cost explanation of market value. But, even from the entrepreneur point of view, the values of the costs look as much like results of value as like causes of value.

One caution, however, is here called for. It has long been the vicious habit of economists to proceed directly from changes in the supply of productive factors to the changing values of these factors,—to assume, that is, that the analysis, valid for the price determination of consumable goods, may be safely applied to production goods. But again be it said that the causal sequence runs not directly from the supply of instruments, but first to the supply of products, then to the value of products, and, only as the last step, to the value of instruments.

The law of the falling price of a consumable good with an increasing supply of that good holds in its usual formulation only because the demand schedule with any one line of consumption goods may be taken as a fixed fact. New supplies can be marketed only on terms of such prices as shall tap lower levels of price-paying disposition. If, however, the increase is one of a productive agent, there results a new and larger volume of value product, and a rearrangement of the conditions of demand. The new level of remuneration is to be worked out only as the outcome of a new problem of distribution. There is assumed a new volume of value product to be imputed to a new and a rearranged and readjusted set of productive agents. So, then, with population increasing relatively to the other factors, there may be expected a fall in the level of wages, but this only by virtue of two influences: (1) a less than proportional increase in the product to be distributed; (2) less favorable terms of distribution for labor relatively to the other agents concerned in the technological process.

It is evident, then, that the corollaries of this Law of Proportions, taken in the dynamic and competitive sense, are many and important. The applications are far wider, far more difficult, and far more significant than a mere analysis of the bearing of all the different possible changes in the supplies of productive factors (population changes among all the rest), upon prices in general, upon prices of agricultural products in the aggregate, and upon prices of specific agricultural products. For there are also the various distributive problems. Taking for granted an aggregate social product, greater or smaller, and taken, as already solved, the problem of the values of these products, there remain to be analyzed the terms and proportions under which these various value prod-

ucts are to be distributed among the co-operating factors, each share being regarded not merely in the aspect of an absolute compensation, but also as a compensation relative to the other compensations.

For example, what must be the effect, both absolutely and relatively, of changes in population upon land rents, machinery rents, wages, profits, and discount rates? What effect from changes in per-capita technological efficiency? From changes in the supplies of skilled labor of different sorts? Of unskilled labor? From expanding credit and increasing loan fund? From changes in the supplies of machines and appliances, both in volume and in kind? From changes by the opening up of new lands? From mproving transportation between the old lands?

And it may be noted also that, as bearing to explain the changes in the prices of consumption goods, this Law of Proportions is fundamental to the study of the incidence of commodity taxes upon consumers,—the process of forward shifting; while, as explaining the modifications in rent, profits, wages, and time discount, as distributive shares out of a jointly produced product, this law is fundamental to an understanding of the process of backward shifting.

To resume, then: This Law of the Proportions of Factors, in no matter which one of its varying formulations and applications, derives its validity from the purely mechanical and technological—and changing—limitations upon the substitution of factors one for another. But the combinations and factors with which it has to do are legion. It breaks up into sub-laws: (1) of social tenor, both static and dynamic; (2) of competitive tenor, both static and dynamic. These laws of the competitive sort have a wide range of subordinate formulations and applications,—among others, bearings upon the values of consumable goods of every sort, upon the distributive shares

of co-operating productive factors, indefinite both in variety and in technological combination, upon discount rates, upon the distribution of tax burdens, and upon the capitalized values of such productive factors as are subject to the capitalizing process.

### *The Law of Advantage and Size.*

For some purposes the use of the terms Diminishing and Increasing Returns is extremely unfortunate, not merely because each of the terms has come to be used in a perplexing variety of meanings, but, more seriously still, because of the misleading antithesis implied.

For, evidently, if disadvantage goes with the unskilful combination of cost factors, it must also be true that advantage goes with the skilful combination. If in one case loss occurs through adding a factor already in sufficient supply, it must be equally the case that advantage accrues through increasing the supply of a factor not yet adequately present. If a falling rate of compensation goes with the making of certain increases, it is thereby implied that more of something else is needed to arrive at the best proportions between factors. And, if the bad management manifested in the bad proportioning of factors is indicated under the Law of Diminishing Returns, should not the Law of Increasing Returns connote the good results that go with the wise adjustment of factors? But this would be to give two names to what in point of causation is only one law,—the significance of the bad proportion of factors.

And more than this: if it be true that, while disadvantage is resulting to a given business through a bad proportioning of factors, an equal or a greater advantage may be at the same time reaped from the mere fact of

the mere size of the business unit,—if, that is to say, the proportions of the factors may have one causal bearing, and an increase or a decrease in the size of the unit may have another bearing altogether, irrespective of the question of proportions, there is evidently another difficulty presented. What shall we call this law—or these laws—of good or ill results attendant upon the mere matter of size? Note also that this increase of size may be attained by adding more land to land or more labor to labor or more instruments to the instruments already in hand. The proportions between factors may have little or no significance. If there are also two laws here, one of increasing and the other of diminishing returns, each appropriate accordingly as the experience is fortunate or unfortunate, we must now face the difficulty not merely of having two laws formulating the effects of one cause, but also the difficulty of using the same pair of terms for two entirely distinguishable sets of causes.

Assuming, however, so far as we may, that in current usage some approximately definite meaning has attached to the terms "Diminishing" and "Increasing" returns, it would seem desirable to rename the Law of Diminishing Returns as the Law of the *Proportions of Factors*, and the Law of Increasing Returns as the Law of *Advantage and Size*.[1]

[1] Professor Bullock has very unfortunately interpreted the Law of Diminishing Return as valid and pertinent with reference only to production upon land. ("The Variation of Productive Factors," Quarterly Journal of Economics, August, 1902.) And, while rightly emphasizing the bearings of the laws of return upon market prices, Professor Bullock appears to discuss and to formulate these laws upon the assumption that their bearing upon prices is their only or their controlling reference and application. But it is clear enough that in the history of doctrine the distributive aspects have demanded no less attention than the price aspect. In point of fact, also,—as has already been sufficiently urged,—they offer the more serious difficulties of analysis, present a greater number of important theoretical bearings, and afford by far the larger occasion for disastrous errors in practical applications. And it may also be repeated that much ambiguity—as well as occasional error—must attend the failure to distinguish doses of time or labor cost from doses of value cost, and likewise must attend the failure to distinguish returns in concrete product from returns in value product.

But, even so, we are not yet quit of all our perplexities. For, after all is said, many of the advantages seemingly dependent on the sheer increase in the size of the business unit are in reality the mere expression of the fact that a bad proportion has hitherto existed between the entrepreneur factor and the other factors in the productive complex. May not this indeed be the ultimate explanation for all the advantages going with the giant organization? It is at all events clear that, no matter how many other classes of factors there may turn out to be,—whether three or three thousand,—entrepreneur ability forms one class, at the least. And this factor, or these factors, of entrepreneur ability may be in defect or in excess relatively to the other factors in the productive combination. The entrepreneur may have in charge all that he can advantageously attend to; or, on the other hand, a part of his supervisory and managerial power may be running to waste. Is then, in itself, size a distinct and separate cause of advantage? This needs looking into.

It is at any rate to be said, in support of a distinct and separate law of Advantage and Size, that there are some lines of industry and some conditions in which there clearly accrues a diminishing advantage with increasing size; *e.g.*, in farming ordinarily and in manufacturing under conditions of the limited market imposed by undeveloped methods of transportation. This situation, commonly especially characteristic of farming, is in itself an illustration of the very law which superficially it might appear to deny. Farming exemplifies the Law of Advantage and Size, only that the advantage goes not with the larger business, but rather with the smaller.

Not merely this, but the Law of Proportion of Factors not only has, as we have seen, a technological basis, but it implies, in any given set of cost levels, a best tech-

nological combination in relation to each particular entrepreneur. It is after all a Law of Proportions between different sorts of costs, some or all of which are based upon ultimate technological relations.[1]

On the other hand, the Law of Advantage and Size has seemingly little relation to the technological situation, and still less reference to the technological proportions in the business unit. For, as has already been noted, the advantages of the giant industry are readily attained through the addition of more labor to labor or more machines to machines or more land to the land already employed. The question mostly refers to the size of the investment, the aggregate operating fund of value, irrespective of its technological applications or of the apportionment of this aggregate fund among the different sorts of cost bases. Size refers here not to the kind or quantity of the instruments and appliances of production,—not to capital in the technological sense, but rather to capital in the competitive entrepreneur sense, as the total of the value resources employed in the business, irrespective of its technological or non-technological application or apportionment, whether into land or labor or machinery or what not.

This is not at all to deny that many undertakings suffer from a lack of business capital relatively to entrepreneur ability,—suffer, that is, from the fact that there is an unsaturated margin of supervisory power which is running entirely to waste. Cases of this sort, falling accurately within the Law of Proportion of Factors, are easily confused with other cases properly ranging

[1] Some of these costs are truly commonly technological, but it is equally clear that some are commonly not so. Not only is it true that the technological factors to be correlated are legion, but also that there are other costs which are entirely lacking in the technological basis, but which are none the less submitted to the necessity of proportion; *e g*, insurance, advertising, and taxes, and, in general, those lines of expense connected with administrative and sales departments,—clerks, book-keepers, travelling men, and the like.

under the Law of Advantage and Size. But the distinction is theoretically none the less clear. Several competing consumers may often advantageously unite, and may advantageously retain all the old managers as special department managers or as together constituting a new managerial board. The aggregate of managerial effectiveness may be appreciably greater through this fusion, and may stand as of itself an illustration of the general Law of Advantage and Size. And therewith may go also other important economies and efficiencies, not only of supervision and organization in the mechanical processes of production, but as well in the buying of raw materials and in the sale and the delivery of the product.

The Law of Advantage and Size is, therefore, a real and valid law entirely distinguishable from the Law of Proportion of Factors *and in no sense the antithesis of it.* Any industry may easily illustrate both laws at one and the same time,—may indeed illustrate the beneficial working of the one and the injurious working of the other. The undertaking may, for example, be excellently organized in point of proportions and may yet be either too large or too small; or it may be of the desirable size and yet relatively over-supplied with capital goods or with plant or with unspecialized working fund or with land; or it may be overmanned; or it may be inadequately supervised.

It is, however, important to note that for competitive purposes the law of changing proportional value productivity with changes in the size of the business unit is not safely to be taken to apply in any one line of industry regarded as a group aggregate, but only to the competing industries inside the group. For it may readily be true that the organization of any industry into the

giant form may so reduce the costs therein that, even with an expanding product by weight and tale, the aggregate product is a smaller one. And this might hold of manufacturers as a whole as over against agriculture as a whole.

Nor can the law rightly imply that greater value productivity goes per unit of expense with increasing size. This is not necessarily true. It is safe to assert only that to the greater industrial unit goes the *relatively* greater product or profit. For when the elasticity of consumption is not great, and when competition among rival businesses is close, lower prices may obtain to the extent to bring a lower value productiveness for each industrial unit and a generally lower average of value product and of profit. And yet it may remain true that the larger units suffer least, and that to these larger units there accrues a relative advantage.

Nor is the Law of Advantage and Size concerned with the fact that in industries of heavy investment and of heavy fixed charges the extra cost of successive items of product is less in proportion to the increase of weight-and-tale product,—a formulation which, as of necessity, says nothing as to the aggregate increase in value going with the increase of product, but leaves it possible to be assumed that the entrepreneur will limit his product at the point where the extra expense of production, together with the falling prices upon the original product, balances the extra value represented in the added items. In truth, cases of this sort present a peculiar illustration of the Law of Proportion of Factors; for its best results—demand for products and prices of products standing at a given level—the industry is calling for a changed proportion of productive factors, or it is being found true that the proportion of factors, ordinarily and in the long run best for value results, is temporarily not the best.

If, for long-run purposes, it is regarded as undesirable to make an all-round increase in the size of the unit, the best adjustment for temporary purposes must be reached through a proportionment of factors which would be a maladjustment for long-time purposes. This comes about through the fact that, as a long-time competition, the fixed charges must be computed as costs, and that in this competition the costs must stand as an aggregate over against an aggregate of value product. Cost for long-time purposes is rather an average than a marginal cost. But in the short-time reckoning the marginal computation is valid, if only all the elements are properly included. To this sort of marginal cost fixed charges are for the most part irrelevant.

It appears, then, that to find out what there really is in this Law of Advantage and Size it is necessary rigidly to exclude all influences of improving technique (developing human beings) and all influences ranking under increased demands for products, and to confine ourselves to the sheer competitive advantages of combination or concentration (1) for increased weight-and-tale product per unit of expense, (2) for increased value product per unit of expense.

It is obvious that no a priori reason exists why this Law of Increasing Return might not characterize all industries. If it does not or if it does so unequally, the reason must be sought in the peculiar nature of the industry in question. The law may fail to hold with certain industries, because by the nature of the instruments which they employ or of the processes required (*e.g.*, as with land), the business unit cannot greatly increase, the giant organization being impracticable; or the market may be of so limited powers of consumption as to render giant organization impossible. And, as has already been

seen, the law is clearly not one referring by necessity to the interdependence of factors or to the constitution of the business unit in respect to the factors included.

It remains to point out that this Law of Advantage and Size, like the Law of Proportions of Factors, has also its different aspects of service accordingly as it is taken in its static or in its dynamic aspects. It may be invoked to explain some of the phenomena of rising or falling prices. Or its service may lie in the analysis of the tendency of profits toward rise, or fall, or differentiation; or its significance may be found in estimating the forces making for consolidation or monopoly in business; or, finally, some bearing may conceivably be deduced upon land rents, upon the wage level, and upon time-discount rates. That is to say, this law also is fundamental in its significance for the explanation of the prices upon consumable goods and for arriving at the forces determining the outcome of the distributive process. It follows, also, that this law must be appealed to in the examination of the forward shifting to tax burdens upon consumers, and as well also in the examination of backward shifting. This backward shifting must obviously take place through the modification of the distributive shares apportioned out of a product jointly produced by the various productive factors. A tax limiting the market for any product and appropriating a part of the reduced total of value will not merely reduce the aggregate value fund to be distributed as shares to the various co-operating factors, but will commonly also appreciably modify these shares relatively to one another.

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